National Bureau of Standards
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U. S. DEPARTMENT OF COMMERCE
JESSE H. JONES, Secretary
NATIONAL BUREAU OF STANDARDS
LYMAN J. BRIGGS, Director

MINERAL WOOL; LOOSE, GRANULATED, OR FELTED FORM, IN LOW-TEMPERATURE INSTALLATIONS

COMMERCIAL STANDARD CS105–43

Effective Date for New Production
from March 1, 1943

A RECORDED VOLUNTARY STANDARD
OF THE TRADE

UNITED STATES
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PROMULGATION

of

COMMERCIAL STANDARD CS105–43

for

MINERAL WOOL; LOOSE, GRANULATED, OR FELTED FORM, IN LOW-TEMPERATURE INSTALLATIONS

On April 28, 1942, the Industrial Mineral Wool Institute proposed the establishment of a commercial standard for Mineral Wool; Loose, Granulated, or Felted Form, in Low-Temperature Installations. Following several preliminary meetings, a proposed standard was prepared and submitted to manufacturers and to a number of technical, distributor, and consumer organizations for comment. After being adjusted in accordance with the composite recommendations, the recommended standard was circulated to the trade for written acceptance. Those concerned have since accepted and approved the standard as shown herein for promulgation by the United States Department of Commerce, through the National Bureau of Standards.

The standard is effective for new production from March 1, 1943.

Promulgation recommended.

I. J. Fairchild,
Chief, Division of Trade Standards.

Promulgated.

Lyman J. Briggs,
Director, National Bureau of Standards.

Promulgation approved.

Jesse H. Jones,
Secretary of Commerce.

MINERAL WOOL; LOOSE, GRANULATED, OR FELTED FORM, IN LOW-TEMPERATURE INSTALLATIONS

COMMERCIAL STANDARD CS105–43

PURPOSE

1. The purpose of this commercial standard is (a) to establish minimum specifications for insulating low-temperature areas with mineral wool for the guidance of manufacturers, distributors, installers, contractors, and users; (b) to avoid delays and misunderstandings; and (c) to provide a basis for guaranteeing compliance.

SCOPE

2. This standard covers minimum physical and chemical requirements of loose, granulated, and felted mineral wool for use in insulating low-temperature areas. It includes thickness of insulation required for various operating temperatures, specifications for auxiliary materials, tests, installation requirements, and method of guaranteeing compliance with the standard.

MATERIAL [1]

3. *Insulation.*

3a. *Mineral wool.*—The insulation shall be of mineral wool manufactured from rock, slag, or glass. It may be in loose, granulated, or felted form and shall meet the following requirements:

(1) The thermal conductivity (k) shall not exceed 0.27 Btu per hour per square foot per degree Fahrenheit temperature difference per inch thickness at a mean temperature of 50° F as determined by the procedure recommended by the National Bureau of Standards. (See Journal of the American Society of Heating and Ventilating Engineers, vol. 26, No. 7, October 1920.)

(2) The installed density, as recommended by the manufacturer, shall not be less than the minimum required to comply with the 0.27 (k) specified above.

(3) The sulfur content shall not exceed 0.75 percent by weight when determined by the evolution method.

[1] During the war emergency period, some material specified in this standard may be considered critical and therefore unobtainable. For example, "Finish" as covered by paragraph 10 calls for the use of metal lath as a support for interior plaster. Should metal lath not be available owing to Government order, an alternate material may be used if it provides a strong key for the application of plaster.

(4) The mineral wool shall contain no substances that will support mold growth or vermin. It shall be odorless and noncombustible.

4. *Auxiliary material.*

4a. *Asphalt.*—Asphalt shall be odorless, with a softening point of from 180° to 200° F, penetration at 77° F of from 20 to 35, and a ductility at 77° F of not less than 3. The following American Society for Testing Materials standard test methods for asphalt shall be used:

(1) Softening point, A. S. T. M. Designation D 36–26 or later revision.

(2) Penetration, A. S. T. M. Designation D 5–25 or later revision.

(3) Ductility, A. S. T. M. Designation D 113–39 or later revision.

4b. *Asphalt primer.*—Asphalt primer shall meet the requirements of A. S. T. M. Specification D 41–41 or later revision.

4c. *Building paper.*—Building paper shall be slater's felt or its equivalent. It shall be vapor permeable but water repellent, that is, it shall shed water but shall allow the passage of moisture in vapor form.

4d. *Cement.*—Portland cement shall meet A. S. T. M. Specification C 150–41 or later revision.

4e. *Hydraulic lime.*—Hydraulic lime shall be type *a*, high calcium hydraulic lime meeting A. S. T. M. Specification C 141–42 or later revision.

4f. *Metal.*—Steel and other metals used shall be galvanized, sherardized, or otherwise well protected against deterioration from corrosion.

4g. *Wood.*—The lumber shall be kiln dried, Douglas fir, yellow pine, cypress, or other suitable species, impregnated or treated to resist moisture.

CONSTRUCTION

5. *General.*—All material used in insulating low-temperature areas in accordance with the requirements of this standard shall be properly installed to give satisfactory performance and long service. The specific forms of mineral wool insulation, i. e., loose, granulated, or felted, shall be installed at uniform density as recommended by the individual manufacturer.

REFRIGERATED SPACES

6. All refrigerated compartments shall be insulated with mineral wool to not less than the thickness specified in table 1 for the stated operating temperature.

TABLE 1.—*Minimum thickness of mineral-wool insulation required for various operating temperatures*

Temperature	Thickness
°F	*in.*
45 and above	2
35 to 45	3
20 to 35	4
5 to 20	5
−5 to 5	6
−20 to −5	8

7. *Preparation of Surfaces.*

7a. *Masonry or plaster surfaces.*—When a membrane-type vapor barrier is to be applied the surfaces shall be roughened to insure a good mechanical key and made true and even by back plastering. Surface shall be free from paint, oil, dust, dirt, soot, or any other material that might prevent a satisfactory bond. Immediately preceding the application of the plaster, the wall shall be thoroughly washed with clean water and allowed to dry until uniformly damp and suction is restored. The plaster shall be applied in one or more coats to ¼-inch minimum thickness at all high points, and floated with a straightedge until smooth. Back plaster and interior finish shall be mixed in the proportion of 1 part portland cement to which not more than 20 percent by dry weight of hydrated lime has been added to 3 parts of mason's sand or 1 part high calcium hydraulic hydrated lime to 3 parts mason's sand by volume. Water that is free from foreign matter shall be added in the minimum amount to produce required workability.

7b. *Asphalt primer.*—All masonry or plaster surfaces to which a membrane-type vapor barrier is to be applied shall be primed with two coats of asphalt primer brushed or sprayed. The surfaces shall be thoroughly dry before priming, and the first coat of primer shall be allowed to dry thoroughly before the second coat is applied.

7c. *Wood surfaces.*—All cracks, knotholes, and other open defects in wood surface shall be blocked off or covered before the vapor barrier is applied.

8. *Vapor barrier.*

8a. In order to limit the infiltration of air and moisture into the refrigerated space, a suitable vapor barrier (moisture-vapor proof seal), having a permeability not to exceed the equivalent of 1 gram of water per square foot per day under a vapor-pressure difference of 17.1 millimeters of mercury, shall be placed against the warmer side of walls, floor, and ceiling. The vapor barrier shall be installed continuously and carefully bonded to the supporting construction. The vapor barrier shall provide effective resistance against moisture-vapor entry under the given operating conditions and may be made in accordance with one of the following methods:

(1) Two (2) hot-mopped layers of asphalt properly heat bonded with open-mesh fabric or 15-pound saturated rag felt between.
(2) One (1) hot-mopped layer of asphalt into which a plain or creped duplex paper shall be firmly and uniformly pressed.
(3) Two (2) hot-mopped layers of asphalt properly heat bonded.
(4) Moisture-proof preparations (hot or cold) for trowel, spray, or other type of application.

9. *Supporting construction.*—The supporting construction shall be one of the types covered by paragraphs 9a to 9b (4) inclusive. In selecting the type of construction to be used, consideration should be given to the operating temperature that must be maintained, the necessity for close temperature control, and the cost of the particular construction involved.

9a. *Floors and ceilings.*

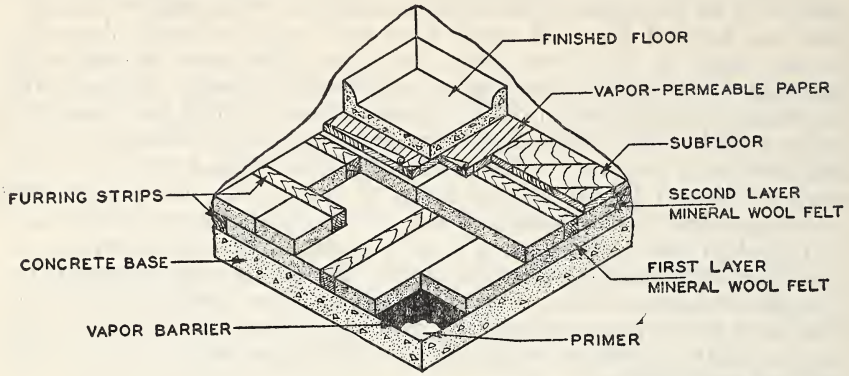

FIGURE 1.—*Floor.*

9a (1). *Cross-furring construction.*—This construction shall consist in cross-furring two or more layers of treated wood strips at right angles, as illustrated by figure 1 for flooring and figure 2 for ceiling. Each course of furring strips shall be of uniform depth.

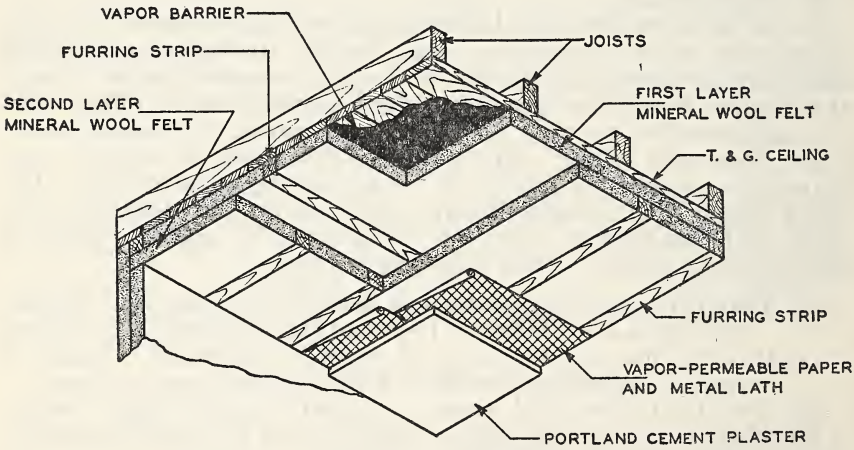

FIGURE 2.—*Ceiling.*

9a (2). *Joist construction.*—This construction shall consist of treated wood joists having a depth equal to the required insulation thickness, as illustrated by figure 3 for flooring and figure 4 for ceiling.

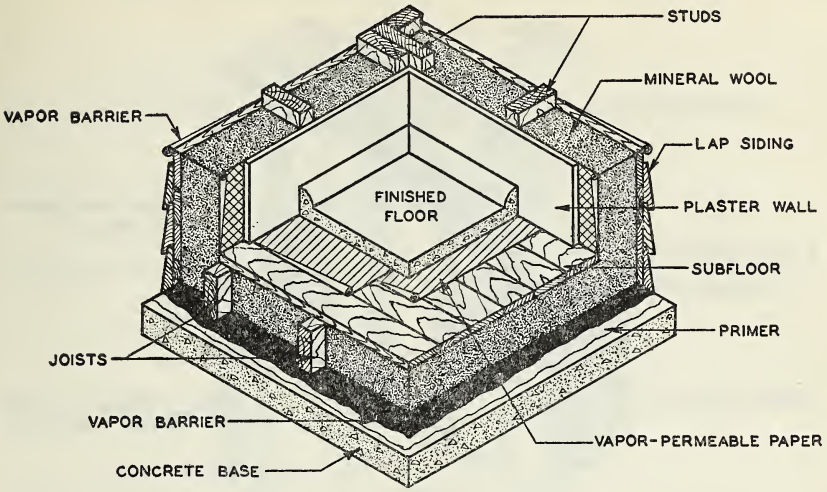

FIGURE 3.—*Floor.*

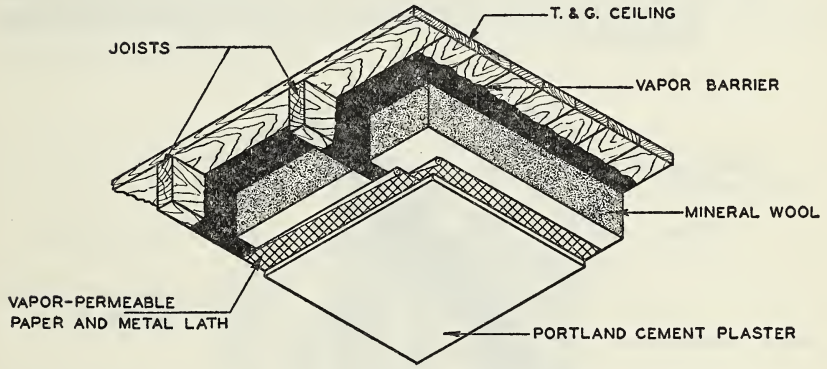

FIGURE 4.—*Ceiling.*

9b. *Walls.*

9b (1). *Spaced construction.*—This construction shall consist of either steel or treated wood supporting strips of a depth less than the required insulation thickness, and shall be one of the following methods:

(a) For exterior masonry walls, the construction shall be as illustrated by figure 5.

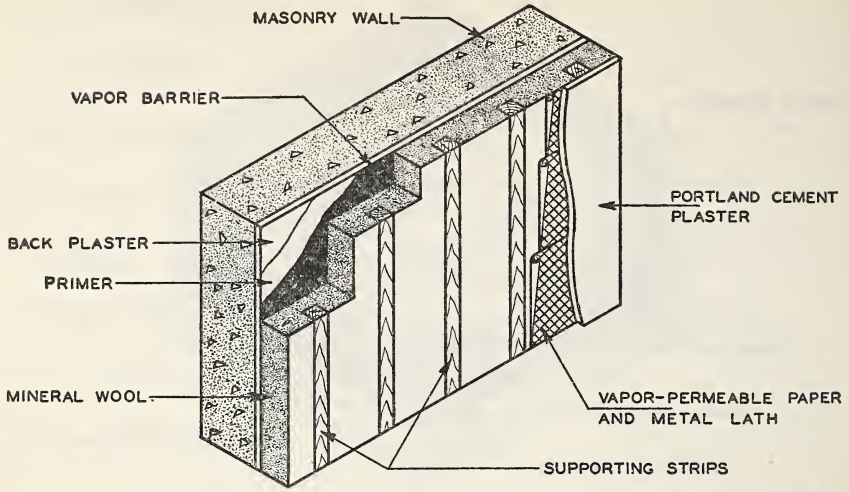

FIGURE 5.—*Wall.*

(b) For exterior or interior wood walls containing included studs on warm (outer) side, the construction shall be as illustrated by figure 6.

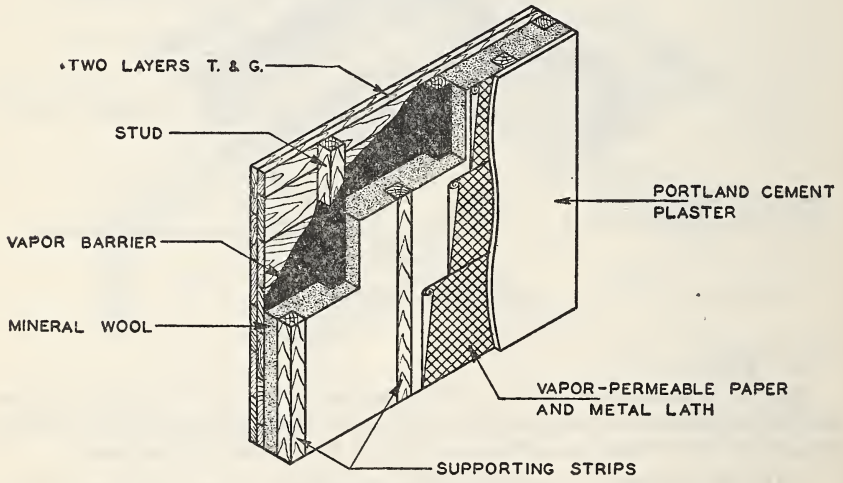

FIGURE 6.—*Wall.*

(c) For interior enclosing wall with exposed studs on warm (outer) side, the construction shall be as illustrated by figure 7.

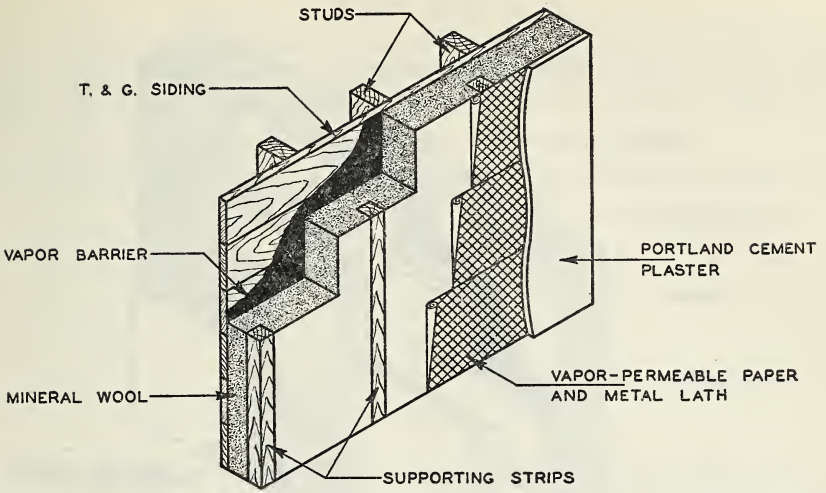

FIGURE 7.—*Wall.*

9b (2). *Stud construction.*—This construction shall consist of treated wood studs having a depth equal to the required insulation thickness, as illustrated by figure 8.

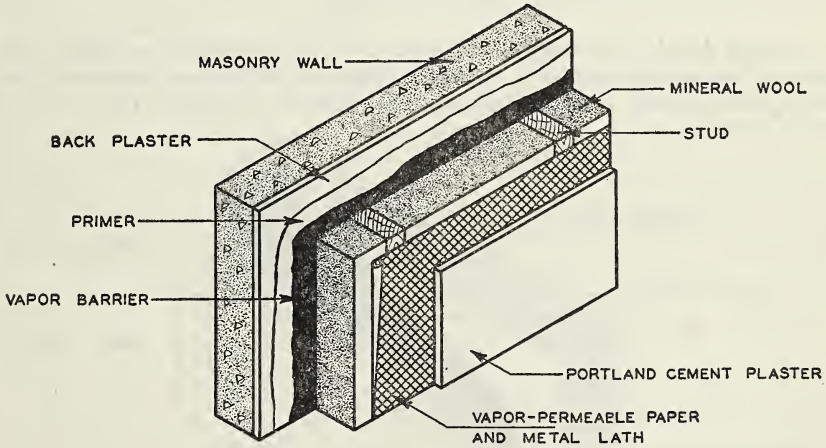

FIGURE 8.—*Wall.*

9b (3). *Cross-furring construction.*—This construction shall consist in cross-furring two or more layers of treated wood strips at right angles, as illustrated by figure 9. Each course of furring strips shall be of uniform depth.

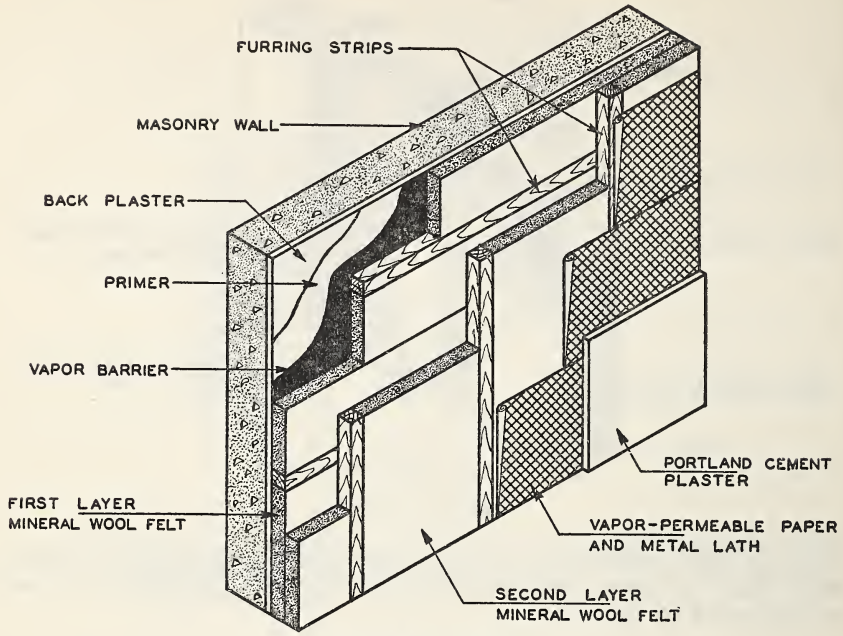

FIGURE 9.—*Wall.*

9b (4) *Double masonry construction.*—This construction shall consist of two self-supporting masonry walls, with the enclosed air space completely filled with insulation, as illustrated by figure 10.

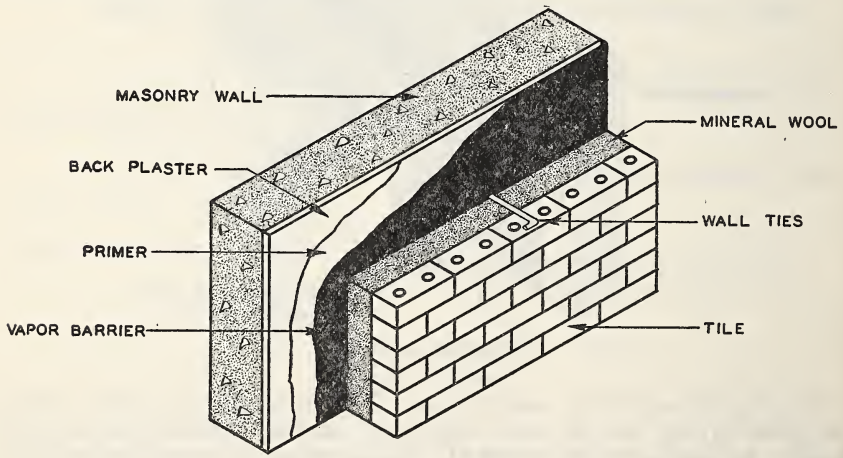

FIGURE 10.—*Wall.*

10. *Finish.*—The interior finish to be used is governed by the type of supporting construction employed. The finish recommended for wood or steel supporting construction is a layer of vapor-permeable paper and metal lath covered with portland cement plaster ½ inch thick, or a layer of vapor-permeable but water-repellent building paper covered with square-edged sheathing.

PIPE LINES

11. When cold pipe lines, including flanges and fittings, are insulated with felted mineral wool, the insulation shall be built up to not less than the thickness specified in table 2 for the required operating temperature.

TABLE 2.—*Minimum built-up thickness of mineral-wool insulation required for various operating temperatures*

Temperature	Thickness
°*F*	*in.*
45 to 15	2
15 to −5	3
−5 to −20	4
−20 to −40	5
−40 to −60	6

12. *Preparation of surface.*—All surfaces shall be thoroughly cleaned and dried before insulation is applied, and, once installation has begun, the system shall not be put into operation until the application has been completed. Pipes and other equipment to be insulated shall be relocated, if necessary, to provide an uninterrupted clearance around the finished insulation of at least 4 inches in all directions. Low-temperature pipes shall not be located adjacent to heated surfaces. Pipe covering subjected to abrasion shall be suitably protected.

13. *Application of Insulation.*

13a. *Pipes.*—The pipe surface to be insulated shall be primed or mopped with hot asphalt or wrapped with a layer of 15-pound saturated rag felt lapped at least 3 inches at all joints. The initial layer of 1-inch felted mineral wool shall then be applied circumferentially around the pipe, securely tying it with jute or similar twine wrapped spirally on 1-inch centers. A layer of 15-pound rag felt shall be mopped with hot asphalt and applied with 3-inch laps over the first layer of insulation. Additional 1-inch thicknesses of felted mineral wool shall then be applied and sealed in a similar manner until built up to the total specified thickness. Over the final layer of felted mineral wool, two layers of 15-pound saturated rag felt shall be applied with 3-inch laps, mopping each layer separately with hot asphalt. (See fig. 11.)

13b. *Fittings.*—Wherever the pipe is interrupted by fittings, valves, or flanges (and also at every 15 to 20 feet of straight pipe), the pipe insulation shall be carefully sealed off as shown in figure 12. Each layer of felted mineral wool shall be sealed at these points by carrying the 15-pound rag felt down to the previously applied layer of rag felt, not down to the bare pipe in each case. All fittings shall be insulated in the same manner as on adjacent straight piping. Where pipe and fitting insulation meet, the 15-pound rag felt applied on the fittings shall be well sealed to the outer layer of 15-pound rag felt on the pipe insulation.

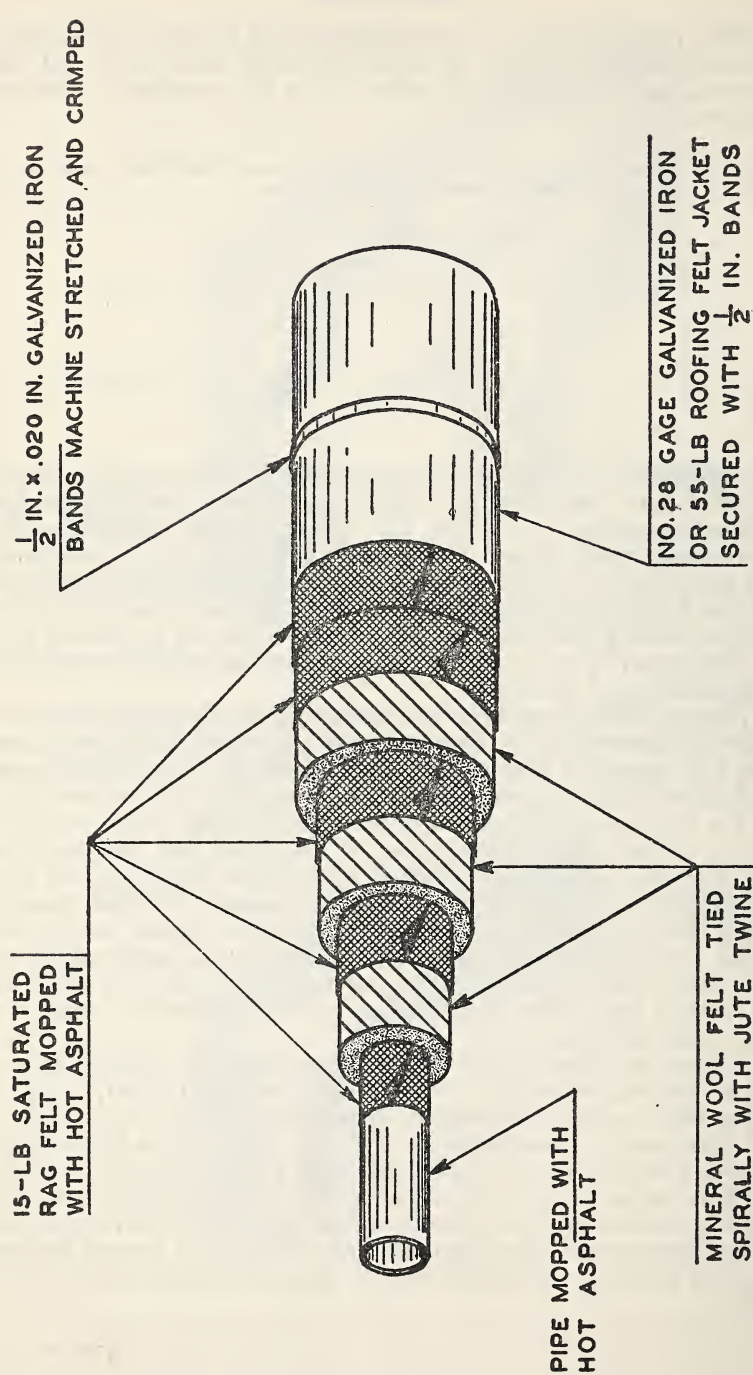
½ IN. × .020 IN. GALVANIZED IRON
BANDS MACHINE STRETCHED AND CRIMPED
NO. 28 GAGE GALVANIZED IRON
OR 55-LB ROOFING FELT JACKET
SECURED WITH ½ IN. BANDS
15-LB SATURATED
RAG FELT MOPPED
WITH HOT ASPHALT
MINERAL WOOL FELT TIED
SPIRALLY WITH JUTE TWINE
SPACED 1 IN. ON CENTERS
PIPE MOPPED WITH
HOT ASPHALT

FIGURE 11.—*Method of insulating pipe.*

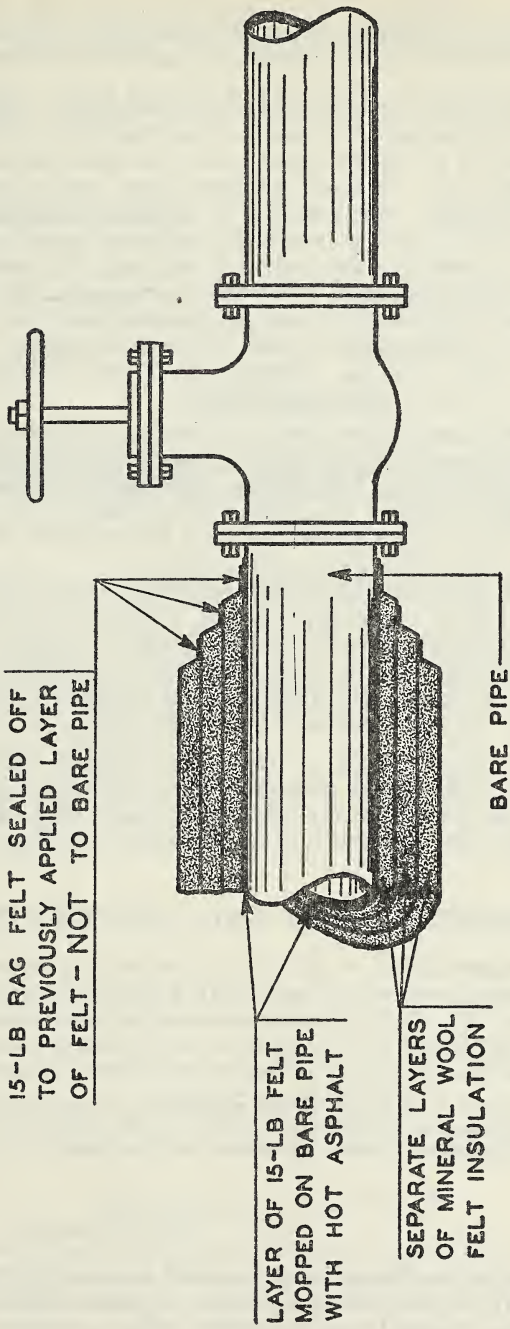
15-LB RAG FELT SEALED OFF TO PREVIOUSLY APPLIED LAYER OF FELT — NOT TO BARE PIPE
LAYER OF 15-LB FELT MOPPED ON BARE PIPE WITH HOT ASPHALT
SEPARATE LAYERS OF MINERAL WOOL FELT INSULATION
BARE PIPE

FIGURE 12.—*Method of sealing-off pipe insulation.*

13c. *Hangers.*—Hangers shall be insulated separately the same as fittings, running the insulation along the supporting hanger rod a distance of not less than 12 inches beyond the adjacent pipe insulation.

14. *Finish.*

14a. *Pipe.*—After the second outer layer of 15-pound rag felt has been mopped with asphalt and applied, the insulation shall be protected with a jacket of No. 28 gage galvanized sheet metal or with a 55-pound roofing felt. If sheet metal is used, each sheet shall be lapped 3 inches against the weather at all joints and permanently secured in place with ½-inch galvanized iron bands spaced on 8-inch to 12-inch centers, machine stretched and crimped. If roofing felt is used as a jacket, all joints shall be lapped as above and the jacket permanently secured in place with ½-inch galvanized bands or with copper or soft galvanized wires spaced on 6-inch to 8-inch centers.

14b. *Fittings.*—All valves, flanges, or other fittings shall be finished by one of the following methods:

(1) A layer of 1-inch galvanized wire-mesh netting shall be tightly stretched over the final layer of 15-pound rag felt and secured in place with No. 18 gage wire. Emulsified asphalt weatherproofing shall then be applied at the rate of 2 pounds per square foot of area (approximately ¼ inch thick wet), trowelling it well into the wire-mesh netting.

(2) A layer of rosin-sized sheathing paper shall be applied over the final layer of 15-pound rag felt, lapping it 3 inches at all joints and sealing the laps with asphalt. A jacket of 8-ounce canvas shall then be sewed or pasted over the rosin-sized paper. If sewed, the stitches shall be spaced not less than three to the inch, located where least visible.

15. *Painting.*—When specified, insulation finished with weatherproofing shall be painted with aluminum or asphalt-base paint; insulation finished with 8-ounce canvas shall be given a coat of glue sizing followed by two coats of white lead in oil, tinted to color selected by the purchaser.

GUARANTEE LABELS AND CERTIFICATES

16. *Manufacturers' labels.*—In order to assure the purchaser that he is receiving mineral wool which will comply with the requirements of this Commercial Standard, it is recommended that manufacturers, individually or in concert with their trade association, issue guarantee labels. The following wording is recommended for such labels:

> This mineral wool is guaranteed to conform to the requirements of Commercial Standard CS105–43, as issued by the National Bureau of Standards, United States Department of Commerce.
>
> ----------
> (Name of manufacturer)

17. The following is a facsimile of the label adopted by the members of the Industrial Mineral Wool Institute to insure distributors and users of receiving mineral wool insulation that conforms to the requirements of this commercial standard.

FIGURE 13.—*Facsimile of Industrial Mineral Wool Institute Label.*

18. *Installer's certificate.*—In order to assure that the mineral-wool insulation is properly installed, it is further recommended that the installer or contractor be required to furnish a certificate guaranteeing that the installation is made in strict accordance with this standard. The following wording is recommended for such certificates, which should be securely attached in a conspicuous place on the door or wall of the insulated compartment:

> This refrigerated compartment is insulated with a ____-inch thickness of mineral wool, installed in strict compliance with the requirements of Commercial Standard CS105–43, as issued by the National Bureau of Standards, United States Department of Commerce.
>
> Date ----------
>
> ----------
> (Signature)
>
> ----------
> (Address)

EFFECTIVE DATE

The standard is effective for new production from March 1, 1943.

STANDING COMMITTEE

The following individuals comprise the membership of the standing committee, which is to review, prior to circulation for acceptance, revisions proposed to keep the standard abreast of progress. Each organization nominated its own representatives. Comment concerning the standard and suggestions for revision may be addressed to any

member of the committee or to the Division of Trade Standards, National Bureau of Standards, which acts as secretary for the committee.

D. H. Shearer (chairman), National Gypsum Co., Buffalo, N. Y.
K. M. Ritchie, Baldwin-Hill Co., 501 Klagg Avenue, Trenton, N. J.
H. E. Lewis, Owens Corning Fiberglas Corporation, Nicholas Bldg., Toledo, Ohio.
E. V. Sanders, Eagle Picher Sales Co., American Bldg., Cincinnati, Ohio.
George K. Bently, McCray Refrigerator Co., Kendallville, Ind. (Representing Commercial Refrigerator Manufacturers Association.)
C. W. Chamberlain, Public Buildings Administration, Federal Works Agency, Room 5302, N. Interior Bldg., Washington, D. C. (Joseph W. Straham, alternate.)
Guy L. Andre, National Association of Ice Industries, 1706 L Street, NW., Washington, D. C.
T. A. D. Jones, Kingan & Co., Indianapolis, Ind. (Representing American Meat Institute.)
George G. Wall, Pacific Fruit Express Co., Room 311, Union Pacific Headquarters Bldg., Omaha, Nebr. (Representing National Association Practical Refrigerating Engineers.)
E. M. Burns, Northwest Frozen Foods Association, 507 Board of Trade Bldg., Portland, Oreg.
James C. Irwin, United States Cold Storage Co., 500 E. Third St., Kansas City, Mo. (Representing National Association of Refrigerated Warehouses.)

HISTORY OF PROJECT

On April 28, 1942, the Industrial Mineral Wool Institute requested the cooperation of the National Bureau of Standards in the establishment of a commercial standard for mineral wool, in the loose, granulated, and felted form and its installation in insulating low-temperature areas. A draft of the proposed commercial standard was submitted on August 11, 1942, to manufacturers of mineral wool, and their comment considered at a meeting held at Cleveland, Ohio, on September 18, 1942. An adjusted draft was then prepared and submitted on October 1, 1942, to manufacturers and to technical, distributor, and consumer organizations for review and comment. The standard was then modified in accordance with the composite recommendation of those concerned and circulated on December 8, 1942, to the trade for written acceptance.

Upon receipt of official acceptances estimated to represent a satisfactory majority of the production volume, and in the absence of active, valid opposition, the standard was promulgated as Commercial Standard CS105–43, effective for new production from March 1, 1943.

ACCEPTANCE OF COMMERCIAL STANDARD

If acceptance has not previously been filed, this sheet properly filled in, signed, and returned will provide for the recording of your organization as an acceptor of this commercial standard.

Date _____

Division of Trade Standards,
National Bureau of Standards,
Washington, D. C.

Gentlemen:

Having considered the statements on the reverse side of this sheet, we accept the Commercial Standard CS105–43 as our standard of practice in the

Production [1] Distribution [1] Use [1] Testing [1]

of mineral wool; loose, granulated, or felted form, in low-temperature installations.

We will assist in securing its general recognition and use and will cooperate with the standing committee to effect revisions of the standard when necessary.

Signature of individual officer _____
(in ink)

(Kindly typewrite or print the following lines)

Name and title of above officer _____

Organization _____
(Fill in exactly as it should be listed)

Street address _____

City and State _____

[1] Please designate which group you represent by drawing lines through the other three. Please file separate acceptances for all subsidiary companies and affiliates which should be listed separately as acceptors. In the case of related interests, trade papers, colleges, etc., desiring to record their general approval, the words "in principle" should be added after the signature.

514401—43——3

(Cut on this line)

TO THE ACCEPTOR

The following statements answer the usual questions arising in connection with the acceptance and its significance:

1. *Enforcement.*—Commercial standards are commodity specifications voluntarily established by mutual consent of those concerned. They present a common basis of understanding between the producer, distributor, and consumer and should not be confused with any plan of governmental regulation or control. The United States Department of Commerce has no regulatory power in the enforcement of their provisions; but since they represent the will of the interested groups as a whole, their provisions through usage soon become established as trade customs and are made effective through incorporation into sales contracts by means of labels, invoices, and the like.

2. *The acceptor's responsibility.*—The purpose of commercial standards is to establish, for specific commodities, nationally recognized grades or consumer criteria, and the benefits therefrom will be measurable in direct proportion to their general recognition and actual use. Instances will occur when it may be necessary to deviate from the standard, and the signing of an acceptance does not preclude such departures; however, such signature indicates an intention to follow the commercial standard where practicable, in the production, distribution, or consumption of the article in question.

3. *The Department's responsibility.*—The major function performed by the Department of Commerce in the voluntary establishment of commercial standards on a Nation-wide basis is fourfold: first, to act as an unbiased coordinator to bring all interested parties together for the mutually satisfactory adjustment of trade standards; second, to supply such assistance and advice as past experience with similar programs may suggest; third, to canvass and record the extent of acceptance and adherence to the standard on the part of producers, distributors, and users; and fourth, after acceptance, to publish and promulgate the standard for the information and guidance of buyers and sellers of the commodity.

4. *Announcement and promulgation.*—When the standard has been endorsed by a satisfactory majority of production or consumption in the absence of active, valid opposition, the success of the project is announced. If, however, in the opinion of the standing committee or the Department of Commerce, the support of any standard is inadequate, the right is reserved to withhold promulgation and publication.

ACCEPTORS

The organizations and individuals listed below have accepted this specification as their standard of practice in the production, distribution, and use of mineral wool, loose, granulated, or felted form, in low-temperature installations. Such endorsement does not signify that they may not find it necessary to deviate from the standard, nor that producers so listed guarantee all of their products in this field to conform with the requirements of this standard. Therefore, specific evidence of conformity should be obtained where required.

ASSOCIATIONS

American Association of Engineers, Chicago, Ill.
American Institute of Refrigeration, Chicago, Ill.
Associated Refrigerating Engineers, Los Angeles, Calif.
Commercial Refrigerator Manufacturers Association, Chicago, Ill.
Heating, Piping & Air Conditioning Contractors National Association, New York, N. Y.
National Association of Ice Industries, Washington, D. C.
National Association of Practical Refrigerating Engineers, Chicago, Ill.
National Frozen Food Locker Association, Inc., Des Moines, Iowa.
Pacific Northwest Refrigerated Locker Operators Association, Corvallis, Oreg.

FIRMS

Acme Refrigeration & Oil Burner Service, Philadelphia, Pa.
Air Conditioning Co., Houston, Tex.
Air Conditioning Corporation, Greensboro, N. C.
Albany Packing Co., Albany, N. Y,
Allen, George W., La Porte, Ind.
Allen Refrigerating Co., Allentown, Pa.
Altfillisch, Charles, Decorah, Iowa.
Alton Mineral Wool Insulation Co., St. Louis, Mo.
American Packing & Provision Co., Ogden, Utah.
American Rock Wool Corporation, Chicago, Ill.
American Ship Building Co., The, Cleveland, Ohio.
Andrews, Jones, Biscoe & Whitmore; Boston, Mass.
Arrow Transfer & Storage Co., Chattanooga, Tenn.
Asbestos & Asphalt Products Co., Inc., South Bend, Ind.
Atlantic States Warehouse & Cold Storage Corporation, Springfield, Mass.
Auler, Jensen & Brown, Oshkosh, Wis.
Baldwin-Hill Co., Trenton, N. J.
Beatrice Creamery Co., Detroit Refrigerating Div., Detroit, Mich.
Belli, Edo J., Chicago, Ill.
Berger & Kelley, Champaign, Ill.
Beuttler, William, Sioux City, Iowa.
Bickford, Robert Turner, Elmira, N. Y.
Bishop, Horatio W., La Mesa, Calif.
Blake, Edgar Ovet, Evanston, Ill.
Blithe, Wesley Lesher, Philadelphia, Pa. (In Principle.)
Boehm, George A., New York, N. Y.
Bogner, Harry, Milwaukee, Wis.
Brainerd, Harry B., New York, N. Y. (In Principle.)
Braseth & Houkom, Fargo, N. Dak.
Brazer, Clarence W., New York, N. Y.
Brown, W. J., Cedar Rapids, Iowa.
Brust & Brust, Milwaukee, Wis.
Bucky, Fred W., Jr., Jacksonville, Fla.
Camlet, J. Thomas, Passaic, N. J.
Cannon & Mullen, Salt Lake City, Utah.
Carder, Macon O., Amarillo, Tex.
Carney Rockwool Co., Mankato, Minn.
Chapin, Rollin C., Minneapolis, Minn. (In principle.)
Chrysler Corporation, Airtemp Division, Dayton, Ohio.
City Ice & Fuel Co., The, Cincinnati, Ohio.
Cleveland Rockwool Co., Euclid, Ohio.
Coast Insulating Corporation, Los Angeles, Calif.
Coit, E., Washington, D. C.
Colonial Rock Wool, Inc., Housatonic, Mass.
Commonwealth Ice & Cold Storage Co., Boston, Mass.
Consumers Ice & Coal Co., Lancaster, Pa.
Coolidge, Shepley, Bulfinch & Abbott, Boston, Mass.
Cooper, David M., Ambridge, Pa.
Cram & Ferguson, Boston, Mass.
Crowell & Lancaster, Bangor, Maine.
DeJarnette, Charles Wagner, Des Moines, Iowa.

Delahanty, Andrew L., Albany, N. Y.
Denby, Edwin H., New York, N. Y.
Diamond Ice & Storage Co., Seattle, Wash.
Dickey, C. W., Honolulu, Hawaii.
Dietel, George J., Buffalo, N. Y.
Donovan, John J., Berkeley, Calif.
Eagle-Picher Sales Co., The, Cincinnati, Ohio.
Fairport Storage & Ice Corporation, Fairport, N. Y.
Fedders Manufacturing Co., Inc., Buffalo, N. Y.
Federal Building Material Co., Tulsa, Okla.
Fish, Inc., Ellis, Bedford, Ind.
Flannagan, Eric G., Henderson, N. C.
Florida, University of, Gainesville, Fla.
Forty-Eight Insulations, Inc., Aurora, Ill.
Gall, Harry L. C., New York, N. Y.
Galveston Ice & Cold Storage Co., Galveston, Tex.
Gay Engineering Corporation of California, Los Angeles, Calif.
General Air Conditioning & Heating Co., San Francisco, Calif.
Geneva Refrigerating Corporation, Geneva, N. Y.
Germantown Cold Storage Co., Inc., Germantown, N. Y.
Gypsum Lime & Alabastine, Canada, Ltd., Toronto, Ont., Canada.
Hahn, Stanley W., Silver Spring, Md.
Hammond Standish & Co., Detroit, Mich.
Haralson & Mott, Fort Smith, Ark.
Harris & Beeman, Inc., Fort Worth, Tex.
Haslett Warehouse Co., Oakland, Calif.
Hasness, Carlisle D., Harrisburg, Pa.
Helfensteller, Hirsch & Watson, Saint Louis, Mo.
Herbert Refrigeration, Waterloo, Iowa.
Higgins, Charles H., New York, N. Y.
Higgins Industries, Inc., New Orleans, La.
Holsman & Holsman, Chicago, Ill.
Hope, Frank L., Jr., San Diego, Calif.
Hopkins, Albert H., Buffalo, N. Y.
Houston Shipbuilding Corporation, Houston, Tex.
Hunter Packing Co., East St. Louis, Ill.
Ice Delivery Co., Aberdeen, Wash.
Ice & Refrigeration, Chicago, Ill.
Ideal Dri Ice Manufacturing Co., Ada, Okla.
Illinois, University of, Urbana Champaign, Ill. (In principle.)
Insulation Industries, Inc., Detroit, Mich.
Ivey, Inc., Edwin J., Seattle, Wash.
Jamme, Bernard E., Summit, N. J.
Johnson & Lundgren, Tacoma, Wash.
Jones Construction Co., Inc., J. A., Wainwright Yard, Panama City, Fla.
Kahn, Associated Architects & Engineers, Albert, Detroit, Mich.
Kansas State College, Department of Architecture, Manhattan, Kans.
Karcher & Smith, Philadelphia, Pa. (In principle.)
Keich & O'Brien, Warren, Ohio.
Kohn, Robert D., & Chas. Butler, New York, N. Y.
Kruckemeyer & Strong, Cincinnati, Ohio.
Krueger Brewing Co., Newark,N. J..
Kyle, Herbert S., Charleston, W. Va.
Larrick, Thomas, Athens, Ohio.
Latenser & Sons, John, Omaha, Nebr.
Law, Law & Potter, Madison, Wis.
Lee, W.H., Philadelphia, Pa.
Levine, Ernest, New Brunswick, N. J.
Levy, Wm. M., St. Louis, Mo.
Little America Finer Frosted Foods Co., Pittsburgh, Pa.
Little Rock Cold Storage Co., The, Little Rock, Ark.
Ludowici-Celadon Co., Chicago, Ill.
Lynch & Foard, Wilmington, N. C.
Macomb Ice Service Co., Mount Clemens, Mich.
Manhattan Storage & Warehouse Co., The, New York, N. Y.
Mann & Co., Hutchinson, Kans.
Manufactured Ice & Cold Storage Co., Service Department, Bloomington Ill.
Mason & Co., George D., Detroit, Mich.
Massena & du Pont, Wilmington, Del.
Mauran, Russell, Crowell & Mullgardt, St. Louis, Mo.
Maxon Construction Co., Inc., Burns City, Ind.
McCray Refrigerator Co., Kendallville, Ind.
Mechanical Heat & Cold, Inc., Detroit, Mich.
Merchants Cold Storage Co., Minneapolis, Minn.
Merchants Refrigerating Co., New York, N. Y.
Mills Novelty Co., Chicago, Ill.
Mills Rhines, Bellman & Nordhoff, Toledo, Ohio.
Mock & Morrison, Tacoma, Wash.
Modern Storage Cooler Co., Philadelphia, Pa.
Monmouth Products Co., Asbury Park, N. J.
Moore Dry Dock Co., Oakland, Calif.
Mooser, William, San Francisco, Calif.
Morell, N. L., Bethlehem, Pa.
Morgan, David H., Philadelphia, Pa. (In principle.)
Morrell & Co., John, Ottumwa, Iowa.
Mueller, F. G., & W. R. Hair, Hamilton, Ohio.
Muhlenberg Bros., Reading, Pa.
Mundie, Jensen, Bourke & Havens, Chicago, Ill.

National Gypsum Co., Buffalo, N. Y.
National Korectaire Co., Chicago, Ill.
Nelson, Albert L., St. Louis, Mo.
Norfolk & Western Railway Co., Roanoke, Va.
Northwest Baker Ice Machine Co., Seattle, Wash.
Officer, Gwynn, Berkeley, Calif.
Ohio Insulation Co., Toledo, Ohio.
Orth, H. W., St. Paul, Minn. (In principle.)
Owens-Corning Fiberglas Corporation, Toledo, Ohio.
Pabst Air Conditioning Corportion, Brooklyn, N. Y.
Pacific Fruit Express Co., San Francisco, Calif.
Pacific Refrigerating Co., Tacoma, Wash.
Parsons Cold Storage Co., Parsons, Kans.
Pehrson, G. A., Spokane, Wash.
Pepper, George W., Jr., Philadelphia, Pa.
Pittsburgh Testing Laboratory, Pittsburgh, Pa.
Platt & Bro., F. P., New York, N. Y.
Poe Co., The C. W., Cleveland, Ohio.
Purdue University, W. Lafayette, Ind.
Purves & Cope, Philadelphia, Pa.
Quality Materials Co., Buffalo, N. Y.
Reid, William H., Jr., Billings, Mont.
Resnikoff, Abraham, Bronx, New York, N. Y.
Reynolds Preserving Co., Sturgeon Bay, Wis.
Ritchie & Associates, James H., Boston, Mass.
Riverton Lime & Stone Co., Inc., Riverton, Va.
Robert & Co., Inc., Atlanta, Ga.
Rock Fleece Co., El Paso, Tex.
Saint Johns River Shipbuilding Co., Jacksonville, Fla.
Saint Louis Fire Brick & Insulation Co., Huntington Park, Calif.
Salem Lime & Stone Co., Inc., Salem, Ind.
San Diego Ice & Cold Storage Co., San Diego, Calif.
Schulzke, William H., Moline, Ill.
Sears, Roebuck & Co., Chicago, Ill.
Sidells, Arthur F., Warren, Ohio. (In principle.)
Southern Pacific Co., San Francisco, Calif.
Specification Record, Chicago, Ill.
Springbrook Packing Co., Cooperative, Springbrook, Oreg.
Staub & Rather, Houston, Tex.
Stegmaier Brewing Co., Wilkes-Barre, Pa.
Sterling Ice & Cold Storage Co., Sterling, Colo.
Stoetzel, Ralph E., Chicago, Ill.
Sturtevant Co., B. F., Cooling & Air Conditioning Division, Hyde Park, Boston, Mass.
Sweets Catalog Service, New York, N. Y. (In principle.)
Tacoma Ice Co., Tacoma, Wash.
Tait & Sons Corporation, R. H., Saint Louis, Mo.
Tampa Cold Storage & Warehouse Corporation (W. B. Haggerty, Inc.), Tampa, Fla.
Taylor, Ellery K., Haddonfield, N. J.
Taylor, Edward Cray & Ellis Wing, Los Angeles, Calif.
Temple, Seth J., — Arthur Temple, Davenport, Iowa.
Tennessee Products Corporation, Nashville, Tenn.
Texas Technological College, Department of Architecture & Allied Arts, Lubbock, Tex. (In principle.)
Texas, University of, Austin, Tex.
Thomas Air Conditioning, Inc., Norfolk, Va.
Thorne, Henry Calder, Ithaca, N. Y.
Tobin Packing Co., Inc., Fort Dodge, Iowa.
United Clay & Supply Corporation, Carrier Division, Baltimore, Md.
United States Air Conditioning Corporation, Minneapolis, Minn.
United States Mineral Wool Co., Emerson, N. J., and Chicago, Ill.
United States Rock Wool Co., Salt Lake City, Utah.
United States Testing Co., Inc., Hoboken, N. J.
Virginia Polytechnic Institute, Blacksburg, Va.
Ware & McClenahan, Salt Lake City, Utah.
Washington, State College of, Engineering Experiment Station, Pullman, Wash.
Waukesha Lime & Stone Co., Waukesha, Wis.
Weaver, Rudolph, Gainesville, Fla.
Weber's Insulating Materials, Los Angeles, Calif.
Welch, Carroll E., Huntington, N. Y.
Wenner & Fink, Philadelphia, Pa.
West, Albert E., Boston, Mass.
Western Air & Refrigeration, Inc., Los Angeles, Calif.
Western Gateway Storage Co., Ogden, Utah.
Western Oregon Packing Corporation, Corvallis, Oreg.
Western Rock Wool Corporation, Huntington, Ind.
White Bros. Smelting Corporation, Philadelphia, Pa.
Whitaker, Courtney, L. Dravosburg, Pa.
Wichita Ice & Cold Storage Co., The, Wichita, Kans.

Willatsen, Andrew, Seattle, Wash.
Williams & Co., Inc., Cincinnati, Ohio, and other cities.
Williams & Richardson, Salt Lake City, Utah.
Wilson, Adrian, Los Angeles, Calif.
Winn Lovett Grocery Co., Jacksonville, Fla.
Wischmeyer, Wm. F., Saint Louis, Mo
Wright & Wright, Detroit, Mich. (In principle.)
Yates American Machine Co., Beloit, Wis. (In principle.)
Young & Richardson, Seattle, Wash.
Zimmerman, A. C., Pasedena, Calif.

U. S. GOVERNMENT

Agriculture, Department of, Washington, D. C.
Federal Works Agency, Public Buildings Administration, Washington, D. C. (In principle.)
Maritime Commission, Oakland, Calif.
Naval Air Station, Public Works Department, Banana River, Fla., Jacksonville, Fla., and Moffet Field, Calif.
Naval Operating Base, Norfolk, Va.
Navy Department, Contract No. 4279, Terminal Island, Calif.
Tennessee Valley Authority, Knoxville, Tenn.
War Department, U. S. Engineer Office, Specification Section, Galveston, Tex., Mobile, Ala., and Norfolk, Va.
War Department, U. S. Army Engineers, Salt Lake City, Utah.

COMMERCIAL STANDARDS

CS No. Item

0–40. Commercial standards and their value to business (third edition).
1–42. Clinical thermometers (third edition).
2–30. Mopsticks.
3–40. Stoddard solvent (third edition).
4–29. Staple porcelain (all-clay) plumbing fixtures.
5–40. Pipe nipples; brass, copper, steel, and wrought iron.
6–31. Wrought-iron pipe nipples (second edition). Superseded by CS5–40.
7–29. Standard weight malleable iron or steel screwed unions.
8–41. Gage blanks (third edition).
9–33. Builders' template hardware (second edition).
10–29. Brass pipe nipples. Superseded by CS5–40.
11–41. Moisture regains of cotton yarns (second edition).
12–40. Fuel oils (fifth edition).
13–42. Dress patterns (third edition).
14–39. Boys' button-on waists, shirts, junior and polo shirts (made from woven fabrics) (second edition).
(E) 15–43. Men's pajamas (made from woven fabrics) (second edition).
16–29. Wall paper.
17–42. Diamond core drill fittings (third edition).
18–29. Hickory golf shafts.
19–32. Foundry patterns of wood (second edition).
20–42. Staple vitreous china plumbing fixtures (third edition).
21–39. Interchangeable ground-glass joints, stopcocks, and stoppers (fourth edition).
22–40. Builders' hardware (nontemplate) (second edition).
23–30. Feldspar.
24–43. Screw threads and tap-drill sizes.
25–30. Special screw threads. Superseded by CS24–43.
26–30. Aromatic red cedar closet lining.
27–36. Mirrors (second edition).
28–32. Cotton fabric tents, tarpaulins, and covers.
29–31. Staple seats for water-closet bowls.
30–31. Colors for sanitary ware.
31–38. Wood shingles (fourth edition).
32–31. Cotton cloth for rubber and pyroxylin coating.
33–32. Knit underwear (exclusive of rayon).
34–31. Bag, case, and strap leather.
35–42. Plywood (hardwood and eastern red cedar) (second edition).
36–33. Fourdrinier wire cloth (second edition).

CS No. Item

37–31. Steel bone plates and screws.
38–32. Hospital rubber sheeting.
39–37. Wool and part-wool blankets (second edition) (withdrawn as commercial standard, July 14, 1941).
40–32. Surgeons' rubber gloves.
41–32. Surgeons' latex gloves.
42–35. Fiber insulating board (second edition).
43–32. Grading of sulphonated oils.
44–32. Apple wraps.
45–42. Douglas fir plywood (fifth edition).
46–40. Hosiery lengths and sizes (third edition).
47–34. Marking of gold-filled and rolled-gold-plate articles other than watchcases.
48–40. Domestic burners for Pennsylvania anthracite (underfeed type) (second edition).
49–34. Chip board, laminated chip board, and miscellaneous boards for bookbinding purposes.
50–34. Binder's board for bookbinding and other purposes.
51–35. Marking articles made of silver in combination with gold.
52–35. Mohair pile fabrics (100-percent mohair plain velvet, 100-percent mohair plain frieze, and 50-percent mohair plain frieze).
53–35. Colors and finishes for cast stone.
54–35. Mattresses for hospitals.
55–35. Mattresses for institutions.
56–41. Oak flooring (second edition).
57–40. Book cloths, buckrams, and impregnated fabrics for bookbinding purposes except library bindings (second edition).
58–36. Woven elastic fabrics for use in overalls (overall elastic webbing).
59–41. Woven textile fabrics—testing and reporting (third edition).
60–36. Hardwood dimension lumber.
61–37. Wood-slat venetian blinds.
62–38. Colors for kitchen accessories.
63–38. Colors for bathroom accessories.
64–37. Walnut veneers.
65–43. Methods of analysis and of reporting fiber composition of textile products (second edition).
66–38. Marking of articles made wholly or in part of platinum.
67–38. Marketing articles made of karat gold.
68–38. Liquid hypochlorite disinfectant, deodorant, and germicide.
69–38. Pine oil disinfectant.
70–41. Phenolic disinfectant (emulsifying type) (second edition) (published with CS71–41).

CS No. Item

71–41. Phenolic disinfectant (soluble type) (second edition) (published with CS70–41).
72–38. Household insecticide (liquid spray type).
73–38. Old growth Douglas fir standard stock doors.
74–39. Solid hardwood wall paneling.
75–42. Automatic mechanical draft oil burners designed for domestic installations (second edition).
76–39. Hardwood interior trim and molding.
77–40. Sanitary cast-iron enameled ware.
78–40. Ground-and-polished lenses for sun glasses (second edition) (published with CS79–40).
79–40. Blown, drawn, and dropped lenses for sun glasses (second edition) (published with CS78–40).
80–41. Electric direction signal systems other than semaphore type for commercial and other vehicles subject to special motor vehicle laws (after market).
81–41. Adverse-weather lamps for vehicles (after market).
82–41. Inner-controlled spot lamps for vehicles (after market).
83–41. Clearance, marker, and identification lamps for vehicles (after market).
84–41. Electric tail lamps for vehicles (after market).
85–41. Electric license-plate lamps for vehicles (after market).
86–41. Electric stop lamps for vehicles (after market).

CS No. Item

87–41. Red electric warning lanterns.
88–41. Liquid-burning flares.
89–40. Hardwood stair treads and risers.
90– . (Reserved for power shovels and cranes).
91–41. Factory-fitted Douglas fir-entrance doors.
92–41. Cedar, cypress, and redwood tank stock lumber.
93–41. Portable electric drills (exclusive of high frequency).
94–41. Calking lead.
95–41. Lead pipe.
96–41. Lead traps and bends.
97–42. Electric supplementary driving and passing lamps for vehicles (after market).
98–42. Artists' oil paints.
99–42. Gas floor furnaces—gravity circulating type.
100–42. Multiple-coated, porcelain-enameled steel utensils.
101–43. Flue-connected oil-burning space heaters equipped with vaporizing pot-type burners.
102– . (Reserved for Diesel and fuel-oil engines.)
103–42. Cotton and rayon velour (jacquard and plain).
(E) 104–43. Warm-air furnaces equipped with vaporizing pot-type oil burners.
105–43. Mineral wool; loose, granulated, or felted form, in low-temperature installations.
(E) 106–43. Boys' pajamas (made from woven fabrics).
(E) 107–43. Commercial electric refrigeration condensing units.

NOTICE.—Those interested in commercial standards with a view toward accepting them as a basis of everyday practice may secure copies of the above standards, while the supply lasts, by addressing the Division of Trade Standards, National Bureau of Standards, Washington, D. C.

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